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10/619,181	07/15/2003	Kouji Takahashi	Q76587	4972

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EXAMINER	
LAZORCIK, JASON L	

ART UNIT	PAPER NUMBER
1791	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/619,181	TAKAHASHI ET AL.	
	Examiner	Art Unit	
	JASON L. LAZORCIK	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *28-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *28-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the Claims

Applicants reply dated November 11, 2009 cancels claims 7,8, 12-17, and 20-27, amends independent claim 28, and adds new claims 29-41.

In view of the instant amendment claims 1-27 stand as cancelled by Applicant and no claims have been withdrawn from consideration. Therefore, claims 28-41 are pending for prosecution on the merits.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 28-41 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 28 recites the limitation wherein “the precision polishing step is for flattening the main surface of the glass substrate subjected to the etching step” in lines 22-23. Applicants specification as originally filed discloses that the precision polishing step is performed to remove “the texture formed on the main surface of the substrate”

(see paragraph [0087]), that said precision polishing makes the surface “relatively even ([0092]), and that after the etching step, the flatness of the glass substrate is "within a predetermined range ([0102]). There does not appear to be supporting basis for the limitation wherein the precision polishing step is "for flattening the main surface of the glass substrate subjected to the etching step" as presently recited

Claim 31 recites the limitation such that the glass substrate is formed by quartz glass. The specification as originally filed supports the use of a glass substrate, however said specification fails to provide supporting basis for the use of a "quartz" glass substrate are recited.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 28-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walker (US 2,372,536) in view of Feng (US 6,596,042 B1) and Hagihara (US 2001/0051746 A1).

(I). **Walker (US 2,372,536):**

Walker teaches an improved method for preparing precision polished glass surfaces. The reference teaches that the method is applicable to the formation of highly polished optical lens, prisms, flats or other like glass objects which, in the absence of evidence to the contrary, are understood to display a "flatness" sufficient for use with one of the claimed source lasers or EUV [**Claim 37**].

In accordance with the Walker disclosure and with particular regard to **Claim 28**, a glass substrate is first subjected to a rough grinding process. The reference teaches that after the rough grinding "it is extremely difficult to properly inspect a stock piece for the presence of relatively deep scratches or marring or internal inclusions or striae or other imperfections" (pg 2, Column 2, Lines 46-74).

The inventors then subject the substrate to immersion in a reactive chemical agent or etching solution which removes the surface debris and rounds off the edges of the workpiece. Walker discloses that after the etching treatment, "any relatively deep surface scratches or other mars will now be readily discernible". Since this chemical etching reaction acts upon "all surface portions", the solution is understood to provide an isotropic etch of the substrate [**Claim 39**]. It is therefore understood that surface

defects are "elicited" through etching process which visually magnifies the surface defect during an inspection of the surface.

The thus etched substrate is further subject to a fine polishing or precision polishing (Page 3, Column 2, Lines 45-46). After said precision polishing, the substrate is optionally subjected to a final dip or "cleaning step" in an etchant solution or chemical debris-clearing solution (Page5, Lines 17-38) [**Claim 32**].

Walker teaches that the defect inspection process may be performed after the etching step (page 3, right column, lines 25-40) and that the etching step may be employed any number of times after any abrasion step (page 5, left column, lines 17-33). Walker further makes plain that it is a known and conventional practice to perform a final inspection of glass articles after precision polishing to detect unacceptable defects (see page 1, right column, line 42 to page 2, left column, line 7). In view of the foregoing, it is the Examiners assessment that Walker either explicitly teaches a step of visually inspecting [**Claim 35]** the substrate for defects after precision polishing or alternately that such a process would be rendered obvious in view of the ordinary level of skill in the art at the time of the invention. That is, one of ordinary skill in the art would reasonably undertake a defect inspection step after precision grinding of the optical element as a matter of routine quality control.

While Walker is silent regarding the use of "quartz glass" as the material of construction of the glass substrate, there is no indication in the Walker reference that the disclosed process is limited to a specific glass composition. Where the Walker process is not expressly limited, it would have been well within the purview of a skilled

technician to adapt the disclosed process to other undisclosed glass materials including for example "quartz glass" **[Claim 31].**

Walker teaches that etch rate of the etchant or cleaning solutions may be controlled by tailoring the ratio of solution constituent hydrofluoric and sulfuric acids, the substrate immersion time, and the bath temperature (Page 3, Column 1, line 44 through Column 2, line 26). The Walker reference is silent regarding a particular limitation upon the amount of material removed from either the etching step or the final cleaning step as set forth in Claims 34, or upon the etch rate of the etching step as per claims 40. Specifically regarding Applicants amended claim language, Walker is silent regarding 1) the limitation wherein etching of the main surface removes “between 0.01-0.20 microns of glass from the main surface” as recited in Claim 36) the limitation wherein etching of the main surface “increases a size of the defect … to width of 0.2 microns or more" as recited in Claim 29, the limitation wherein the cleaning step removes no more than 0.01 microns of glass material as recited in Claim 36.

Finally, Walker is silent on the nature of the abrasive utilized in the polishing procedures as required in Claim 38 or upon the root mean square roughness of the in final optical element as per Claim 33.

Regarding the etched material tolerances as recited in Claims 29, 34 and 40, Walker teaches that the factors affecting etch rate and etch depth, such as etchant concentration, immersion time, and bath temperature, are subject to routine experimentation and optimization. It follows, absent any evidence showing substantially

unexpected results, that one of ordinary skill in the art at the time of the invention would have arrived at the claimed etch rates and/or etch depths through no more than routine optimization of the disclosed process.

With respect to **Claims 34 and 40,** it would have been well within the purview of one of ordinary skill in the art at the time of the invention to provide a cleaning step etch of between 0 to 10nm depth [**Claim 34**] and to likewise control the etch rate to within the claimed ranges of between 0.2nm/min and 2 nm/min [**Claim 40**]. Similarly, where the factors affecting etch rate and etch depth are well established in the art, Applicants recited etch depths for the etchant solution and cleaning solution would have reasonably been derived through no more than routine experimentation and optimization of the prior art process

(II.) Feng (US 6,596,042 B1);

Next, the reference to Feng (US 6,596,042 B1) teaches common techniques, materials, and tolerances considered to be known to skilled practitioners in the field of precision polishing or Chemical-Mechanical polishing (CMP). First, the reference teaches that known slurry formulations comprising silica or ceric oxide are have been developed with ceric oxide being recognized as the most efficient abrasive towards silicon dioxide (e.g. glass) (Column 1, lines 23-33). The reference in Example 4 (Column 5, lines 3-33) further teaches that RMS roughness values of less than 1 angstrom and silica removal rates of less than 85 angstroms/minute are achievable by precision polishing with slurries of silica and/or cerium oxide.

In light of the Feng disclosure and absent any compelling or unexpected results to the contrary, it is the Examiners position that precision polishing operations which use colloidial silica and/or cerium oxide abrasive particles [**Claim 38**] and which remove between 10 and 200nm of silica [**Claim 36**] to yield a surface RMS value of 0.2nm [**Claim 30**] are well within the prevue of one of ordinary skill in the art.

(III.) Hagihara (US 2001/0051746 A1)

The reference to Hagihara relates a method for precision polishing a substrate which provides a minimum "roll-off" (edge rounding of end sides of the substrate) in the polishing process. It is understood by the Examiner that the process termed as “roll-off” in the instant reference is essentially equivalent to applicants claimed "amount of a turned-down edge" of a substrate.

Hagihara discloses that reducing roll-off in glass hard drive substrates is a recognized goal in glass hard drive substrate manufacturing since decreasing roll-off increases data recording area and subsequently leads to higher hard drive capacities. The reference explicitly teaches that various methods are known which can reduce this roll-off effect, "such as making a polishing pad more rigid, and making a polishing load smaller (Page 1, ¶[0004]). The reference continues by disclosing a particular polishing agent which results in a roll off value of “0.2 μm/μm or less, more preferably 0.15μm/μm or less, still more preferably 0.10 μm/μm or less”. It follows from the Hagihara disclosure that the claimed "turned-down edge" tolerances would be recognized as conventional by one of ordinary skill in the art at the time of the invention. Said claimed

ranges would have been achieved through no more than routine experimentation and optimization by a skilled artisan seeking to fabricate a precision polished HD substrate according to the Walker method [**Claim 41].**

(IV.) Brown (US 6,541,168)

The reference to Brown relates to a method for fabricating highly planar and defect free glass bodies suitable for use as optical elements (col. 2, lines 64-66). Of particular relevance to the instant Application, Brown discloses that rough cut glass blanks may be subject to a variety of surface finishing procedures including , inter alia, chemical mechanical polishing, flatness lapping, and flatness polishing to achieve a desired surface finish. Brown notes that the final finish may achieve "a super polish below 5 angstroms finish and flatness".

In view of the brown reference it would appear that Applicants claimed substrate f flatness tolerance of "1 micron or less" would be viewed as conventional by one of ordinary skill in the art at the time of the invention. Said claimed ranges would have been achieved through no more than routine experimentation and optimization by a skilled artisan seeking to fabricate a precision polished substrate according to the Walker method.

The claimed invention requires in part that the etching step is carried out "on the condition that a polishing-off amount is reduced in the precision polishing step and

subsequently so that a "turned-down edge" falls within the stated range after said precision polishing. It is the Examiners understanding According to the claimed invention that the etching step is carried out in order to “polish-off” enough material to eliminate the surface defect while minimize the total amount of material removed during the precision polishing step. The Walker reference speaks directly to this issue noting that;

“In every case it has been found that the employment of one or more of such clearing operations invariably reduces the total amount of grinding and/or polishing and/or other finishing operations which may be required to provide the perfectly finished final product” (page 5, left column, lines 27-33). “Thus, an accurate guide is furnished for the fine grinding process because it will be apparent that until such time as all of the bright points are eliminated the fine grinding reduction process must be continued to obtain accurate leveling of the surface and elimination of any relatively deep scratches or gouge marks which were made by the coarse grinding operation.”

In short, the Walker defect eliciting process decreases the amount of material required for removal during the “polishing-off” step necessary to achieve a perfectly finished final product. Walker further teaches that the elicited defects provide a visual guide or assessment regarding the precise amount of material required to eliminate the surface defects. Where the goal of Walker is to eliminate the elicited defect from the substrate surface, Walker, in essence, implicitly teaches a comparison between the depth of the elicited defect and the amount of material removed by the precision polishing step. Minor modifications to the Walker disclosed process not explicitly

covered by the eliciting and precision polishing steps would have represented obvious extensions over the prior art teachings absent compelling evidence to the contrary.

In summary, the cited prior art references to Walker, Feng, Hagihara, and Brown all relate to fabrication of highly planar and defect free glass substrates such as may be found for example in the glass hard drive or precision optics substrate manufacturing arts.

Walker teaches essentially every element of applicants claimed method including the steps of 1) rough polishing a main surface of a glass substrate, 2) eliciting defects or cracks in the main surface by immersing the substrate in an etching solution, and 3) subsequently subjecting the substrate to a precision polishing step. Walker further teaches that the factors affecting etch rate and etch depth, such as etchant concentration, immersion time, and bath temperature, are subject to routine experimentation and optimization. Walker also instructs that the eliciting step reduces the amount of precision polishing and further reduces the "polishing-off" amount required to remove surface defects.

Feng relates common abrasive materials for use in surface precision polishing operations and also teaches process tolerances (e.g. substrate root mean square roughness values (RMS) and substrate material removal depths) which are deemed conventional at the time of the invention. Similarly, Hagihara teaches that the effects of “edge roll-off”, (e.g. the "amount of a turned-down edge" of a substrate) was

appreciated by practitioners in the art. Hagihara further demonstrates that the claimed "turned-down edge" tolerances would be viewed as merely routine. Likewise, Brown teaches that Applicants recited surface roughness and substrate flatness values would be viewed as within conventionally achievable tolerances by one of ordinary skill in the art of precision polished glass substrates.

Response to Arguments

Regarding the rejection of claims under 35 U.S.C. 103(a) over Walker, Feng and Hagihara, Applicant presents the following arguments.

Argument #1)

Applicant begins by acknowledging that Walker teaches a process for treating a glass substrate which comprises "earlier grinding operations", a surface clearing step after said grinding operations to make any surface scratches or other mars "readily discernible", and finally a “fine polishing action”. Applicant however alleges that Walker was not aware that texture irregularities present after the etching process make it difficult to inspect the “magnified surface cracks” and therefore Walker performs a fine polishing step after the inspection (see page 5).

Stated alternately, Applicant alleges that Walker carries out the inspection after the chemical process at which point Applicant alleges the Walker substrate comprises a

series of low domes or wave-like formations on the substrate surface. Applicant alleges that that the present invention inspects the substrate only after the precision polishing step. Applicant alleges that inspecting the substrate only after the precision polishing step allows detection of defects which can not be discerned because of "texture irregularities left on the surface" after the etching process according to the Walker process.

In response, Applicant is respectfully advised Walker teaches that the defect inspection process may be performed after the etching step (page 3, right column, lines 25-40) and that the etching step may be employed any number of times after any abrasion step (page 5, left column, lines 17-33). Walker further makes plain that it is a known and conventional practice to perform a final inspection of glass articles after precision polishing to detect unacceptable defects (see page 1, right column, line 42 to page 2, left column, line 7). In view of the foregoing, it is the Examiners assessment that Walker either explicitly teaches a step of visually inspecting the substrate for defects after precision polishing or alternately that such a process would be rendered obvious in view of the ordinary level of skill in the art at the time of the invention. That is, one of ordinary skill in the art would reasonably undertake a defect inspection step after precision grinding of the optical element as a matter of routine quality control.

Applicants arguments suggesting that Walker does not teach a post precision polishing defect inspection step are acknowledged but are not deemed persuasive for reasons noted above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON L. LAZORCIK whose telephone number is (571)272-2217. The examiner can normally be reached on Monday through Friday 8:30 am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jason L Lazorcik/
Primary Examiner, Art Unit 1791